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THE GENUS COLEOSPORIUM IN THE NORTHWESTERN UNITED STATES

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(WITH PLATES 22–24 AND 1 TEXT FIGURE)

The genus *Coleosporium* Lév. (Ann. Sci. Nat. III. **8**: 373. 1847) includes only heteroecious species with distinct alternating phases which include pycnia, aecia, uredinia and telia, all of which are subepidermal. The aecia always appear upon the needles of pines and are very similar in appearance. In the earlier European literature, collections were not generally distinguished from the caulicolous rusts, and were referred to as *Peridermium Pini acicola* Wallr., or *P. oblongisporium* Fuckel. Collections of *Coleosporium Senecionis* Fr. on *Pinus silvestris* from an old collection of middle European fungi procured by the writer at Munich are so labeled.

The pycnia are inconspicuous, flat, linear, oval or elliptical structures appearing on both sides of the needle, but are generally on the concave side in one or two rows. When fresh they may be conspicuously yellow, the shade varying with the different species; later or when dry, they are brown or reddish. Some species may be readily distinguished by the color and shape of the pycnia.

The aecia appear on both sides of the needle, with a long or short cylindrical or flattened bladdery peridium which ruptures irregularly either at the top or sides. The cells of the peridium are colorless and usually strongly verrucose. The globose to oblong aeciospores have colorless walls with deciduous tubercles.

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Uredinia appear a: , ulverulent masses in some species with marginal paraphyses and break through the epidermis without a peridium and are at first yellow or orange, but soon fade. The globose to oblong urediniospores are abstricted in short chains with intercalary cells. The spore walls are hyaline, with conspicuous and usually deciduous tubercles. Size and markings of the spore walls are sometimes characteristic.

The telia appear as flat, dense, isolated or confluent, rounded or irregular, orange or yellow wax-like sori, composed of closely crowded teliospores. The young binucleated spore possesses a delicate exosporium enclosing a rich orange oily mass, which increases in quantity up to the time the spore is cut off from the basal cell by a cross wall. After the fusion of the two nuclei which follows the isolation of the spore from the parent mycelium the teliospore is stimulated to germinate internally at once and by two successive divisions, followed in each case by cell division, gives rise to the promycelium, which appears as a structure, an internal basidium with four cells arranged in a chain, one above the other. In some species the formation of secondary spore layers beneath the oldest or first has been observed, but it is not thought to be of any diagnostic value, since it is possible that this phenomenon may be common to all. A long sterigma is produced from each cell of the basidium *in situ* as soon as mature, on which is borne a globose or elliptical basidiospore.

The illustrations show that although morphologically the species of this genus are very much alike, they have in the case of some species very distinct spore characters. For the field worker, however, they are to be distinguished chiefly by their hosts. The color of the pycnia, shape, and position of the peridia are of importance in distinguishing the aecial stages which occur on 2- and 3-needled pines. Grove (**10**) points out as a possible specific character for certain British species, the occurrence of nearly all the aecia on one only of the two leaves of pines. He found this almost always true of *C. Senecionis* Fr. On the other hand, in some species the aecia occur on both needles of the fascicle. This he found to be the case usually with *C. Tussilaginis* Tul. The aecia of *C. Solidaginis* western form on *Pinus contorta* (TEXT FIG. 1) occur usually on one needle of the fascicle in

some collections, but exhibit considerable variation in this respect in other collections. On 3-needle conifers the aecia of this species may occur on all needles of the fascicle, but is usually confined to one. There is at present no adequate explanation why infection is confined to one or more needles of a fascicle. It is probable that owing to the more favorable position of one needle in a cluster more spores lodge on the face of it, hence only one needle is apt to be infested in light infections and more than one in heavy infections. Since species of this genus may be expected to infect a large series of 2- and 3-needle pines, it is not believed that any particular disposition of the aecia in a fascicle will occur with sufficient regularity to serve as a diagnostic character. Cultures show that there is a remarkable specialization on certain hosts or genera, but it does not necessarily follow that every species of *Coleosporium* on a certain telial host is a distinct species. Extensive and repeated cultures will determine these points and is the most satisfactory means of definitely defining the limitation of species.

SYNOPSIS OF SPECIES IN RELATION TO THEIR HOST

Telia and uredinia on Carduaceae—

On *Adenocaulon*..................1. *C. Adenocaulonis.*
On *Madia*........................2. *C. Madiae.*
On *Solidago* and *Aster*.............3. *C. Solidaginis*, western form.
On *Senecio*.......................4. *C. occidentalis.*
On *Sonchus*......................5. *C. Sonchi-arvensis.*
Telia and uredinia on *Ribes*............6. *C. ribicola.*

1. COLEOSPORIUM ADENOCAULONIS Jackson, Brooklyn Bot. Gard. Mem. 1: 202. 1918

O, I and III. *Pycnia, aecia* and *telia* unknown.

II. *Uredinia* hypophyllous, very few, on inconspicuous yellowish spots, obscured by the pubescence of the leaf, small, 0.1–0.2 mm. across, orange-yellow, some fading to white, finally becoming pulverulent after the rupture of the epidermis; *urediniospores* globose to ellipsoid, 16–24 x 22–35.5 μ, wall slightly yellowish when fresh, soon fading, 2–3 μ thick, conspicuously but not densely verrucose; pores not definitely demonstrated. Jackson states that they are indistinct.

On Carduaceae II.

Adenocaulon bicolor Hook., Washington, Oregon (type) and Idaho.

The rust is apparently very rare, but is apt to be overlooked owing to the inconspicuous nature of the infections. The pine hosts would necessarily have to be either *Pinus contorta* or *P. ponderosa*, or both.

2. COLEOSPORIUM MADIAE Cooke, Grevillea **7**: 102. 1879. Type locality Sierra Nevada, Calif., on *Madia Nuttallii*

Stichopsora Madiae Syd. Ann. Myc. **2**: 30, *pl. 2, figs. 1, 2.* 1904.
Coleosporium arnicale Arth. N. Am. Fl. **7**: 94. 1907. (See PLATE 22, FIG. 1 for the similarity of the Urediniospores with that of *C. Madiae.*)

O. *Pycnia* amphigenous, scattered, originating between mesophyl and cortical layer, not particularly noticeable, 0.5–0.8 mm. broad by 0.6–1 mm. long, about 95 μ high, brown to slightly reddish.

I. *Aecia* flattened laterally, 0.8–1.6 mm. long by 0.7–1.4 mm. high, peridial cells ellipsoid to ovoid in face view, sometimes acute at both ends, overlapping, 30–36 x 56 x 90 μ, the side walls 5–8 μ thick, the inner walls closely and evenly verrucose with more or less uniform papillae; *aeciospores* (PLATE 22, FIG. 2) broadly ellipsoid to ovoid, averaging 28.7 x 33.6 μ, range 25.5–32.2 x 28.9–38.9 μ, the walls 4.6 μ, varying in thickness, evenly verrucose, sometimes appearing smooth at one end due to the shortness and scarcity of the papillae.

II. *Uredinia* hypophyllous, 0.5–1 mm. across, early naked, bright orange-yellow fading to white, ruptured epidermis noticeable; *urediniospores* (PLATE 22, FIG. 3) ellipsoid to globose, average 26 x 30.2 μ, range 24.6–28.7 x 25.3–34.6 μ, walls medium but unequally thickened, 2.2 x 4.7 μ, densely, coarsely and irregularly verrucose with conspicuous and somewhat deciduous papillae. Probable overwintering under favorable conditions.

III. *Telia* hypophyllous, 0.5–1 mm. across, scattered or gregarious, often confluent, orange-yellow fading to pale yellow; *teliospores* with wall swelling 20–30 μ thick above, cylindrical or oblong-lanceolate, 16–20 x 48–65 μ, obtuse or acute at both ends; contents orange-yellow fading to colorless.

On Pinaceae O, I.

Pinus Jeffreyi "Oreg. Com.," Oregon.

On Carduaceae II, III.
Madia racemosa (Nutt.) T. & G., Washington.
Madia sativa Molina., Washington, Oregon.
Madia citriodora Greene, Oregon.
Madia glomerata Hook., Oregon.
Madia ramosa Piper, Oregon.
Madia exigua (Sm.) Greene, Oregon.

General Distribution: Pacific Coast of the United States.

Definite information on the life history of this rust has not been published. Field observations, however, point to an aecial connection on *Pinus radiata*. Near Waldo, Oregon, in 1916, the writer collected the rust on *Madia exigua* in direct association with aecia on the needles of *Pinus Jeffreyi*. The microscopical character of the rust on the latter host fully agrees with material collected by Boyce on *Pinus radiata* in Golden Gate Park, at San Francisco, and by Meinecke on the same host at Monterey. The above description of the aecia is drawn from the material collected at Waldo and is taken to represent the true aecial stage of *C. Madiae*.

The microscopical character of *Peridermium californicum* Arth. and Kern (**4**) based on material collected by Holway at Monterey, California, and said to be on *Pinus radiata*, differs from the material from which the above description is drawn. The aecia of *Peridermium californicum* are less conspicuous. The peridial cells, of practically the same size, are usually more obtusely rounded at the ends with the inner walls more coarsely verrucose and thicker. The aeciospores (PLATE 22, FIG. 4), more variable in shape and not so regularly broadly ellipsoid, average 27.9 x 38.4 μ (Arthur, 25–29 x 40–45 μ), range 22.5–33.7 x 33.3–44 μ. The walls are thicker, average 3.8–6.7 μ, and are more coarsely and irregularly verrucose, with a greater tendency to appear smooth at one end. In addition, an examination of the structure of the needles of the type material shows a single vascular bundle. This, together with the fact that in one case in the writer's collection of the type the needles occurred in a bundle of four instead of three, indicates a misdetermination of the host. The needles in the type collection are small in diameter and length, averaging 7 cm. Those of *Pinus radiata* average 12 cm. in

length and are large and coarse with two distinct vascular bundles. This fact would indicate that the type collection of *Peridermium californicum* is probably on a white pine with unknown telial connection.

3. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. Bull. Torrey Club **6**: 216. 1878. (PLATE 23, FIGS. 1–4.) Western form

Peridermium montanum Arth. & Kern, Bull. Torrey Club **33**: 413. 1906.

O. *Pycnia* amphigenous, scattered, inconspicuous, 0.3–0.5 mm. broad by 0.5–1 mm. long, low, conoidal, 55–65 μ high, reddish-brown.

I. *Aecia* (PLATE 23, FIG. 1) flattened laterally, 1–1.5 mm. long by 0.5–1 mm. high, rupturing irregularly; peridial cells large, ovoid to ellipsoid, 23–35 x 45–75 μ, colorless, delicate, *generally acute at both ends*, slightly overlapping and *easily separating*, the side walls 3–4 μ thick, rather minutely and regularly verrucose with short papillae of irregular shape (PLATE 23, FIG. 2); *aeciospores* (PLATE 23, FIG. 3) oblong to linear-oblong, average 19.9 x 29.9 μ (16–24 x 32–45 μ, Arth. and Kern), range 17.1–22.9 x 21.6–38.2 μ, the wall 2–3 μ, range 2–4.5 μ, closely and finely verrucose.

II. *Uredinia* hypophyllous, irregularly scattered or gregarious and crowded, 0.2–2 mm. broad, soon naked, orange-yellow when fresh, ruptured epidermis inconspicuous; *urediniospores* (PLATE 23, FIG. 4) globose, 19.9 x 27.4 μ, range 17.7–23.3 x 22.2–31.5 μ, *walls thick, 2–4 μ*, closely and finely verrucose with papillae of uniform height, contents orange-yellow when fresh, fading to colorless.

III. *Telia* hypophyllous, scattered or extensively confluent, depending on extent of infection, elevated when mature, 0.2–0.6 mm. or more across, yellowish to reddish-orange; *teliospores* with more or less uniform walls, occasionally swollen above to 25–35 μ thick, 15–25 x 40–75 μ, rounded at both ends; contents yellowish-orange becoming colorless when dry; basidiospores produced in decoctions of host, globose, 10 x 14 μ, yellowish-orange.

On Pinaceae O, I.

Pinus contorta Dougl., Wash., Oregon, Idaho and Montana (type), not on *Pinus ponderosa* var. *scopulorum* as reported.

On Carduaceae II, III.

On various species of *Aster* and *Solidago*, Washington, Oregon, Idaho and Montana.

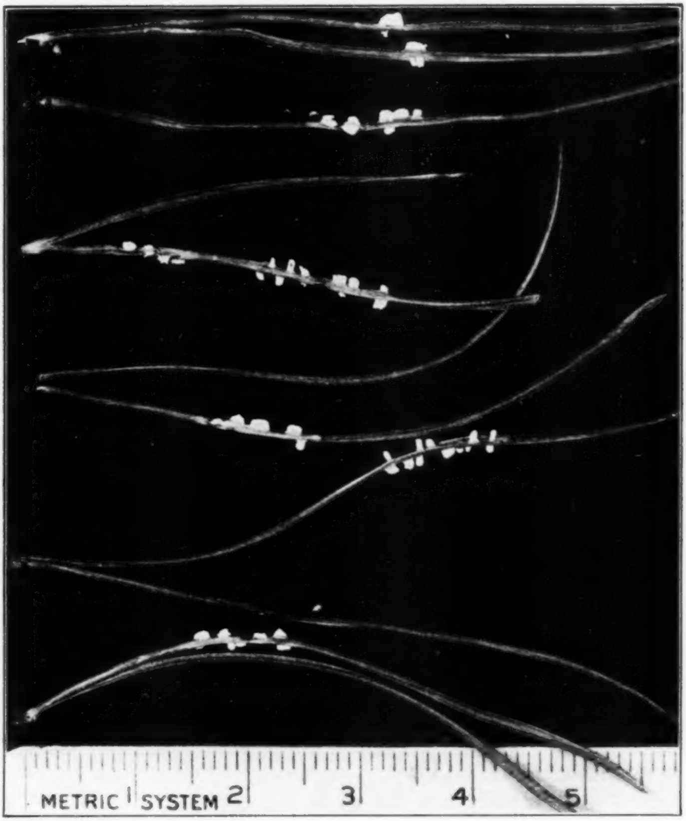

FIG. 1. *Coleosporium Solidaginis*, western form on needles of *Pinus contorta* showing infections on one and two needles of the fascicle

The life cycle of the western form of *Coleosporium Solidaginis* was first demonstrated by Hedgcock (**12**). He successfully inoculated *Aster conspicuus* with aeciospores from the needles of *Pinus contorta* collected near Bozeman, Montana. On the result of this experiment Hedgcock based his conclusions that the *Coleosporium* on *Aster* in the West is identical with *Coleosporium Solidaginis* of the East. This relationship was also suggested by Weir and Hubert (**22**). Arthur (**2**), however, in 1907 had already combined the two forms but did not hold the aecial stages

identical in a later publication (**4**). Jackson (**14**), although pointing out the dissimilarity between the two forms, recognizes but one American species. As first shown by Arthur and Kern, the aecia of two forms are morphologically distinguishable, a fact not considered by the former author in his latest publication (**3**).

In order to determine if the eastern form of *Coleosporium Solidaginis* would maintain its peculiarities when grown in the West on a western grown conifer, the following experiment was performed. In September, 1919, a quantity of leaves of *Solidago canadensis* L., bearing abundant telial sori from Scott County, Indiana, was intermingled with the needles of a young 4-year-old tree of *Pinus rigida* in one of the city parks at Spokane, Washington. On June 10, 1920, several needles bearing mature aecia were collected. There were no other infections in the neighborhood. It may be safely assumed that the aecial infection was a result of the inoculation with the Indiana material. This assumption was immediately verified by an examination of the minute characters of the aecia which were found to agree in every particular with eastern material. This experiment seems further to justify the conclusions that the eastern and western *Coleosporium* on *Aster*, *Solidago* and related genera are not identical.

For completeness and as a means of comparison, O, I, and II of the eastern form of *Coleosporium Solidaginis* may be described as follows:

O. *Pycnia* 0.3–0.5 mm. broad by 0.5–0.8 mm. long, low-conoidal, 80–100 μ high.

I. *Aecia* (PLATE 23, FIG. 5) flattened laterally, 0.5–1 mm. long by 0.6–1.2 mm. high; *peridial cells* (PLATE 23, FIG. 6) ellipsoid, rarely ovoid, 23–27 x 40–70 μ, colorless, *firm, with the ends generally obtuse*, overlapping and *not easily separating*, the side walls 5–9 μ thick, very coarsely and prominently verrucose with closely set papillae of uniform size; *aeciospores* (PLATE 23, FIG. 7) regularly ellipsoid, average 24.8 x 32.2 μ (20–24 x 28–40 μ, Arth. and Kern), range 23.1–28.1 x 23.5–41 μ, the wall varying in thickness, 3.6 μ, sometimes 8 μ, closely and coarsely verrucose, with prominent, somewhat deciduous tubercles, *with a smooth spot extending up one side.*

II. *Uredinia* hypophyllous, rarely also epiphyllous, irregularly

scattered and usually separated, 0.3–1 mm. broad, soon naked, yellow or orange when fresh, ruptured epidermis inconspicuous; *urediniospores* (PLATE 23, FIG. 8) *generally globose*, average 20.4 x 30.2 μ, range 15.6–23.8 x 23.3–38 μ; walls rather *thin*, 1–2 μ, closely and coarsely verrucose with irregularly formed papillae; contents yellow when fresh, fading to colorless.

The life cycle of the eastern form of *Coleosporium Solidaginis* was first demonstrated by Clinton (**7**). He successfully inoculated *Solidago rugosa* with aeciospores from *Pinus rigida*.

With the same material with which he inoculated *Aster conspicuus* Hedgcock failed to infect *Solidago canadensis* which supports the suggestion by Sydow (**20**) that the form on *Aster* is different from the form on *Solidago*, and that it either represents an unattached species having a different aecial form or should be combined with the Asiatic *C. Asterum* (Diet.) Syd. Weir and Hubert (**22**), however, using aeciospores from *Pinus contorta*, successfully inoculated both *Aster* and *Solidago* obtaining infections on *Aster laevis Geyeri*, *Solidago canadensis* and *S. missouriensis*. The character of the uredinia and telia resulting from these inoculations on *Aster* and *Solidago* agreed in all essential details. This result, and subsequent experiments by the writer in the field whereby both *Aster* and *Solidago* were infected with the same aecial material, does not lend support to Sydow's view in the case of the western fungus. The writer has repeatedly transferred the rust by means of urediniospores from *Aster* to *Solidago* and from *Solidago* to *Aster*. It appears that similar experiments have not been performed in the case of the eastern rust.

The most recent work on these rusts is that of Hedgcock and Hunt (**13**). They state that the results of their inoculations indicate that in the eastern United States *C. Solidaginis* is a rust attacking species of *Solidago* but not those of *Aster*. The *Coleosporium* on species of *Aster* is apparently distinct from *C. Solidaginis*. *Peridermium montanum* Arth. and Kern apparently belongs to a rust on *Aster* and if so is distinct from *Peridermium acicolum* Underw. & Earl, the aecial form of *C. Solidaginis*.

The ability of the eastern form of *Coleosporium Solidaginis* to overwinter on rosettes of species of *Solidago* and *Aster* has been known for several years. Clinton (**6**), in 1906, first called atten-

tion to the occurrence of the uredinial stage of this rust on *Aster* and *Solidago* in Connecticut during the winter months. Ludwig (**17**), in 1914, reported a similar condition on *Aster* and *Solidago* in Indiana. Mains (**18**), in 1915, found the rust overwintering on rosettes of *Solidago*.

The overwintering of the western form of *Coleosporium Solidaginis* is also of common occurrence. The first observations were made in 1914, at which time urediniospores were found in abundance on *Solidago missouriensis* in midwinter. This condition was again demonstrated in 1916 (**23**) in the greenhouse at Missoula, Montana, on *Aster conspicuus* and *A. laevis Geyeri*. The leaves of rosettes of these species produced urediniospores throughout the winter. After cutting off all the leaves of the plant it was found that the new ones that developed from the stub were infected. Since there was no other source of infection, it would appear that the fungus was perennial in the stems. Since this time overwintering has been repeatedly observed on various species of *Aster* and *Solidago* and at such times of the year when only the rosettes of the plants were in evidence and before it was possible for the plants to be infected with aeciospores from pines.

Rhoads, Hedgcock, Bethel and Hartley (**19**), in 1918, report the overwintering of this rust on *Aster laevis*, *A. Porteri*, *Solidago missouriensis* and *S. oreophila* in Colorado.

4. COLEOSPORIUM OCCIDENTALIS Arth. N. Am. Fl. **7**: 94. 1907.
(PLATE 24, FIGS. 1, 2)

The first field evidence of the aecial connection of this rust is shown by a collection at Newport, Washington. A narrow-leaved form of *Senecio triangularis* from which 14 leaves were collected bearing uredinia and telia grew in close juxtaposition to a young 3-year-old seedling of *Pinus contorta* with aecial infection. Since species of *Aster* and *Solidago* on the same area were infected with *Coleosporium Solidaginis*, it was not possible to draw conclusions. The rust was again collected in August, 1916, on *Senecio triangularis* at Chelan Lake, Washington, in direct relation with aecia on *Pinus contorta*. In September of the same year the rust was found at Darby, Montana, on the

same hosts intermixed with *Coleosporium Solidaginis* on *Aster conspicuus*. In September, 1917, at Victor, Montana, aecia were found on needles of *Pinus contorta* in direct contact with *Senecio triangularis* which was sparingly infected with *Coleosporium occidentale*. *Coleosporium Solidaginis* was not found in the immediate neighborhood although species of *Aster* and *Solidago* were abundant. At Priest River, Idaho, the rust on *Senecio* was associated with Asters heavily infected with *Coleosporium Solidaginis*. Later the rust was again found on *Senecio* directly associated with aecia on *Pinus contorta* described under the name *Peridermium Weirii* Arth.

It would seem from the field evidence that the aecial host of this rust on *Senecio* may be as here indicated. A study of the minute character of the aecia associated with it on *Pinus contorta* shows some difference from that of *Coleosporium Solidaginis* on the same host. The aeciospores (PLATE 24, FIG. 1) are ellipsoid, often much elongated, average 18.7 x 29.6 μ, range 17.3–23.3 x 21.6–36.7 μ, walls coarsely and closely verrucose, thick, 2.5–6 μ. These characters conform somewhat to those for *Peridermium Weirii*. Since the infections on *Senecio* and the aecial stage on pine in at least two cases seem sufficiently conclusive, it may be that the aecial connection is as indicated. The whitish appearance of the uredinia and the absence of any pronounced reddish color of the telia of *C. occidentale*, also the sharply isolated areas affected, may serve to distinguish this rust on *Senecio* from *C. Solidaginis* on *Solidago* and *Aster*. The minute characters of the urediniospores (PLATE 24, FIG. 2) differ decidedly from those of the latter. The spores of the type material are as follows: globose to broadly ellipsoid, average 25 x 31 μ, range 20.1–27.6 x 24.8–34.8 μ (type description 16–22 x 25–33 μ), walls unevenly thickened, range 2–6 μ, evenly verrucose with short papillae. A complete description of the species will be withheld until the aecial stage has been definitely determined by cultures.

On Pinaceae O, I.

Pinus contorta Dougl.?, Washington, Montana.

On Carduaceae II, III.

Senecio triangularis Hook., Washington, Oregon, Idaho, Montana.

Senecio hydrophiloides Rydb., Falcon Valley, July 17, 1900, *W. N. Suksdorj 586* (type), Washington.

5. COLEOSPORIUM SONCHI-ARVENSIS (Pers.) Lév.; Berk. Outl. Brit. Fung. 333. 1860

The following description is based on the collections of this rust made by Davis in Wisconsin:

O. *Pycnia* amphigenous, scattered, not numerous, originating between mesophyl and cortical layer, inconspicuous, 0.1–1 mm. long, 0.1–0.2 mm. broad, 60–90 μ high, dehiscent by a longitudinal slit.

I. *Aecia* amphigenous, not numerous, scattered, laterally compressed, erumpent from longitudinal slits, 1–2 mm. long, 0.1–2 mm. high, peridium irregularly dehiscent, delicate, white, cells overlapping, 34–70 μ long, 17–33 μ broad, inner wall moderately verrucose, moderately thick, 3–5 μ, outer wall less rough; *aeciospores* ellipsoid to globose, 20–34 x 16–26 μ; wall colorless, densely verrucose, moderately thick, 2–3 μ.

II. *Uredinia* hypophyllous, small, round or in irregular groups, yellowish-orange fading to white, ruptured epidermis not prominent; *urediniospores* ovate to subglobose, 18–28 x 15–21 μ; wall thin, 0.1–1.2 μ, densely and finely verrucose.

III. *Telia* hypophyllous, scattered, small, often confluent, 0.3–0.7 mm. in diameter, yellowish-red fading to yellowish-brown; *teliospores* cylindrical or clavate-oblong, 75–100 x 14–25 μ, rounded or obtuse at each end, wall at summit 14–18 μ thick; contents orange-red fading to colorless.

On Carduaceae II, III.

Sonchus arvensis L., Hillyard, Spokane Co., August 27, 1915.

This collection was made along the track of the Great Northern Railroad and has not again appeared. It was evidently introduced.

The life history of this species was first demonstrated by Ed. Fischer (**9**). He inoculated needles of *Pinus silvestris* with teliospores from *Sonchus asper* in the autumn of 1893, and obtained pycnia and aecia the following spring. With the aeciospores thus obtained he successfully inoculated *Sonchus oleraceus*. Fischer's results were verified by Klebahn (**15**) in 1895, using teliospores from *Sonchus asper*. Later Wagner (**21**) inoculated pines in September and obtained pycnia in the middle of November.

In 1913 Davis (**8**) collected the aecia of this rust near Sturgeon Bay, Wisconsin, on *Pinus silvestris* in direct relation with the telial stage on *Sonchus asper*. In 1915, and again in 1918, he collected the rust on *Pinus silvestris*, *P. Banksiana* and *Sonchus asper*. This rust is mentioned by Bailey (**5**) and Halsted (**11**) as occurring on China asters. They give methods of control. Williams (**24**) refers to the occurrence of this rust in South Dakota.

6. COLEOSPORIUM RIBICOLA (Cooke & Ellis) Arth. N. Am. Fl. **7**: 86. 1907. (PLATE 24, FIGS. 3-5)

Uredo ribicola Cooke & Ellis, Grevillea **6**: 86. 1878.

Uredo Jonesii Peck, Bull. Torrey Club **12**: 36. 1885.

On Pinaceae O, I. Not known to occur in the states covered by this paper.

On Grossulariaceae II, III.

Ribes cereum Dougl., Montana.

Ribes inermis Rydb., Montana.

The aecial connection of this rust on *Ribes* was first demonstrated by Long (**16**) in 1916 by inoculations on *Ribes leptanthum* and *R. longiflorum* with aeciospores from *Pinus edulis*. This host was also similarly infected by Hedgcock and Hunt (**13**). In the same year the needles of *Pinus pinea* were successfully inoculated with telia from *Ribes inebrians* from Boulder, Colo., by Hedgcock and Hunt (**19**). The following year Hunt, using aecial material from Colorado, successfully inoculated the leaves of *Ribes inebrians* (**19**). The occurrence of this rust northward beyond the limits of the range of its aecial host implies that it either winters over in the uredinial stage or has aecial hosts not yet determined. It may be expected to occur on *Pinus ponderosa* and *P. contorta*.

The concentric arrangement of the uredinial and telial sori on the leaves of its host (PLATE 24, FIG. 3) sometimes characterizes the species. The pycnia were described by Hedgcock and Hunt (**13**) as conspicuous in single short rows on chlorotic spots in leaves, hazel to chestnut brown when old, 0.4 mm. wide by 0.7 mm. long. The urediniospores (PLATE 24, FIG. 4) and aeciospores are very characteristic. The former are smaller than

those of any western species so far studied. They are more or less uniformly globose, average 19.9 x 22 μ, range 17.5–21.6 x 18.8–24.4 μ. The walls are thick, unequal, average 2.6–4.3 μ, and densely verrucose with slender cylindrical tubercles. The aeciospores (PLATE 24, FIG. 5) are ellipsoid to globose, average 21.7 x 26.1 μ, range up to 24.4 x 29.8 μ. The walls vary in thickness from 2.6 to 4.5 μ and are densely and evenly verrucose.

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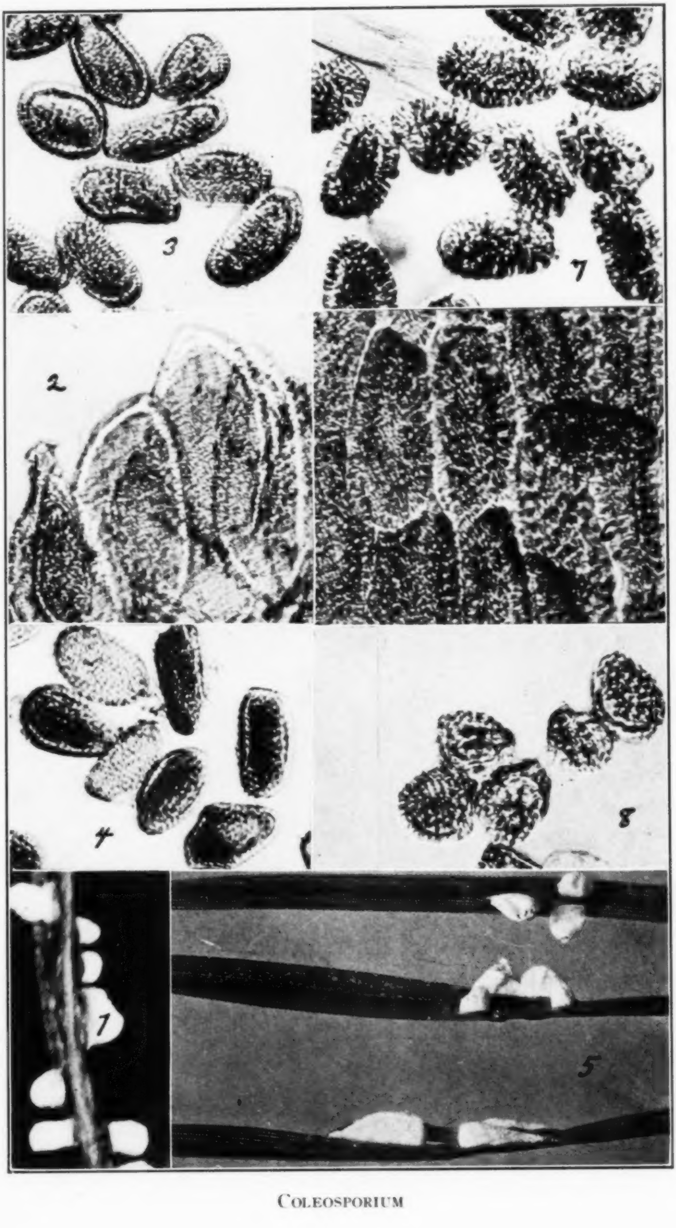
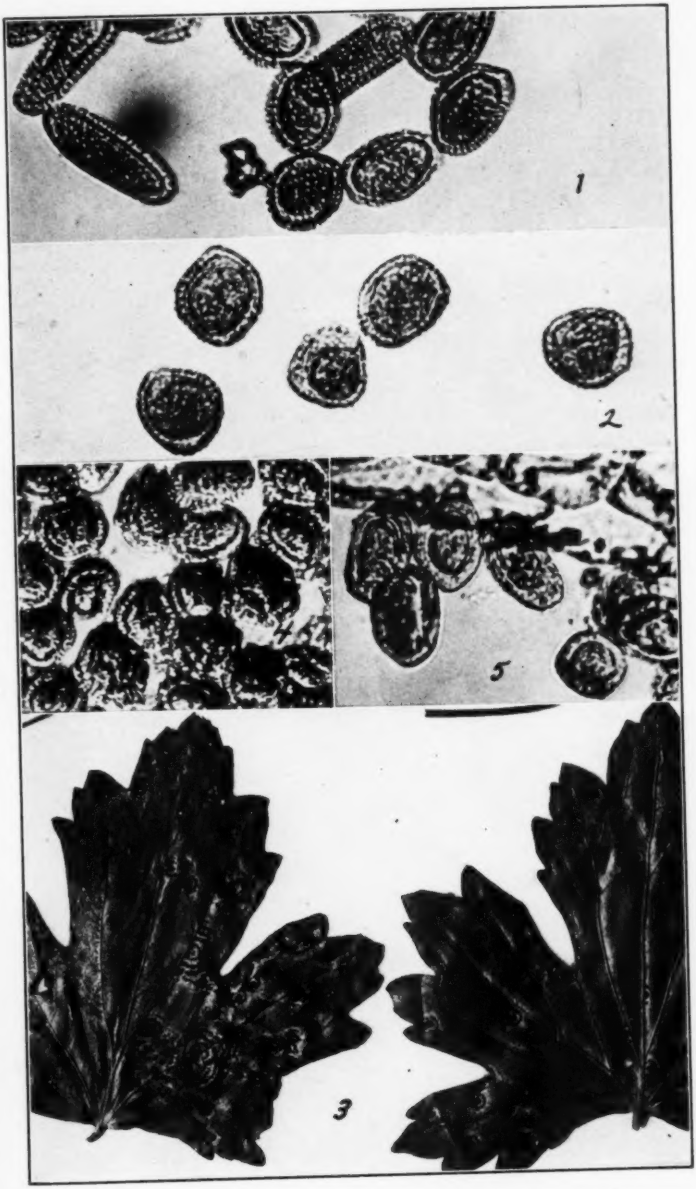


COLEOSPORIUM



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ILLUSTRATIONS

Photographs by Dr. A. S. Rhoads unless otherwise indicated.

EXPLANATION OF PLATES

PLATE 22

Fig. 1. Urediniospores of *Coleosporium arnicale* (*C. Madiae*) on *Arnica cana*. × 532 (type).

Fig. 2. Aeciospores of *Coleosporium Madiae* on needles of *Pinus radiata*. × 532.

Fig. 3. Urediniospores of *Coleosporium Madiae* on *Madia exigua*. × 532.

Fig. 4. Aeciospores of *Peridermium californicum* on *Pinus* sp. × 532 (type).

PLATE 23

Fig. 1. Aecia of *Coleosporium Solidaginis* western form on *Pinus contorta*. × 7½.

Fig. 2. Peridial cells of *Coleosporium Solidaginis* western form from aecia on *Pinus contorta*. × 532.

Fig. 3. Aeciospores of *Coleosporium Solidaginis* western form on *Pinus contorta*. × 532.

Fig. 4. Urediniospores of *Coleosporium Solidaginis* western form on *Solidago missouriensis*. × 532.

Fig. 5. Aecia of *Coleosporium Solidaginis* eastern form on *Pinis rigida*, Takoma Park, Md., from material used by Hedgcock to successfully inoculate *Solidago serotina*. × 4. Photo by Hedgcock.

Fig. 6. Peridial cells of *Coleosporium Solidaginis* eastern form on *Pinus rigida*, Takoma Park, Md. × 532.

Fig. 7. Aeciospores of *Coleosporium Solidaginis* eastern form on *Pinus rigida*, Takoma Park, Md. × 532.

Fig. 8. Urediniospores of *Coleosporium Solidaginis* eastern form on *Solidago serotina*, from above named inoculation, Takoma Park, Md. × 532.

PLATE 24

Fig. 1. Aeciospores of *Coleosporium occidentalis* on *Pinus contorta*. × 532.

Fig. 2. Urediniospores of *Coleosporium occidentalis* on *Senecio hydrophiloides*. × 532 (type).

Fig. 3. Uredinial and telial sori of *Coleosporium ribicola* on *Ribes aureum*, natural size. Photo by Hedgcock.

Fig. 4. Urediniospores of *Coleosporium ribicola* on *Ribes inebrians*. × 532.

Fig. 5. Aeciospores of *Coleosporium ribicola* on *Pinus edulis*. × 532.

NOTES ON THE PARASITIC FUNGI OF ILLINOIS—II

L. R. Tehon and Eve Daniels

(With Plate 25)

As stated in a previous paper (Mycologia **16**: 135–142. 1924) it is our purpose to bring together, as often as time and material make it expedient, the novelties and the interesting species of parasitic fungi collected by the botanists of the Illinois State Natural History Survey. This paper is the second in what the writers hope will prove an interesting series.

Phacidium Negundinis Tehon & Daniels, n. sp.

Cankers extensive on small twigs, thickly dotted with the ascomata, bark remaining dark. Ascomata abundant, irregularly scattered, lying in the epidermis and rupturing epidermis and cuticle at maturity, irregularly stellate in dehiscence, 150–300 μ in diameter. Asci cylindrical to saccate, short- or non-stipitate, 60–70 x 14–17 μ; paraphyses filiform, exceeding the asci. Ascospores continuous, ovoid to oblong, hyaline to greenish, uniformly 20 x 27 μ, protoplasm granular.

On diseased twigs of *Acer Negundo.*

Urbana, Champaign County, Illinois, June 3, 1922. Acc. No. *8890* (type).

The caulicolous habit, the much larger asci and the very large spores furnish ready means of distinction between this species and *P. minutissimum* Awd., which is also reported on *Acer.*

Mycosphaerella cornicola Tehon & Daniels, n. sp.

Inhabiting the dead bark, lesions not definitely marked. Perithecia large, black, spherical, semi-erumpent, 150–225 μ in diameter, ostiole 10–15 μ wide; the perithecium connected with an extensive subiculum of dark brown hyphae which penetrate throughout the decomposed cortex. Asci clavate, 55–70 x 14–18 μ, 8-spored. Ascospores 1-septate, biseriate or irregularly arranged, ochraceous, oblong-cylindrical, with rounded ends, the basal half often somewhat tapered, cells approximately equal, the spore 20–30 x 6–7.5 μ.

In bark of *Cornus stolonifera*.

Apple River Canyon, Jo Daviess County, Illinois, July 17, 1924. Acc. No. *13596* (type).

With this occurs a *Phoma*, so evidently associated as to suggest itself as the pycnidial form. It is described later. The characters of spore and ascus are depicted in PLATE 25, FIG. 1.

Phyllosticta Aquilegiae Tehon & Daniels, n. sp.

Spots circular or subcircular, extensive, 0.5–3 cm. or more in diameter, concentrically marked with rings, brown or reddish-brown. Pycnidia abundant, often crowded, arranged without reference to each other or to the marks on the spot, parenchymatic, yellowish, ostiolate, 105–120 μ in diameter; ostiole 10–15 μ wide. Spores hyaline, ovoid to oblong, 3.5–4 x 7.5–11 μ, biguttulate, very rarely appearing bilocular.

On leaves of *Aquilegia canadensis*.

Marion, Williamson County, Illinois, July 19, 1922. Acc. No. *2098* (type).

The greater length and width of the spores distinguish this species from *P. aquilegicola* Brun.

Phyllosticta pteleicola Tehon & Daniels, n. sp.

Spots circular or subcircular, ochroleucous, depressed, apparent on both sides of the leaf, 1–2 mm. or rarely 5 mm. in diameter. Pycnidia apparent above only, where the ostioles are erumpent, globose, carbonaceous, 60–100 μ in diameter. Spores hyaline, ovoid, 3.7 to 6.5 μ.

On leaves of *Ptelea trifoliata*.

Starved Rock, La Salle County, Illinois, June 27, 1924. Acc. No. *6807* (type).

This differs from *P. Pteleae* Hollós in its smaller pycnidia and smaller, uniform spores, and from *P. hesperidearum* (Catt.) Penzig, which is parasitic upon Rutaceae in Europe, in spot characters, pycnidia and spores. The latter species, reported upon a cultivated *Citrus* in Colorado, probably has not strayed to our common native shrub.

Phyllosticta Allii Tehon & Daniels, n. sp.

Spots very extensive, white, and thickly dotted with the black, evident pycnidia. Pycnidia numerous, carbonaceous, spherical

or elongated between the veins, 60–160 μ in diameter; ostiole prominently erumpent, 15 μ wide. Spores hyaline, oval, 1-guttulate, 3.7 x 7.5 μ.

On *Allium Cepa*.

Columbia, Monroe County, Illinois, August 24, 1922. Acc. No. *11132* (type).

Phomopsis Callistephi Tehon & Daniels, n. sp.

Caulicolous, causing cinereous cankers 3–5 cm. or more long and 1–1.5 cm. wide. Pycnidia abundant, scattered, black, becoming erumpent, 100–150 μ in diameter; ostiole 15 μ wide. Spores hyaline, ovoid but variable, 3.5 x 7.5 μ; ends pointed. Stylospores filiform, curved, hyaline, apparently non-septate, 15–20 x 1–2 μ.

On stems of *Callistephus hortensis*.

Shelbyville, Shelby County, Illinois, September 20, 1924. Acc. No. *2014* (type).

In addition to its mycological newness, this species is of interest as the cause of a serious stem canker on an important floricultural plant. It is reported to have been prevalent and destructive throughout the summer of 1924 in the locality mentioned, causing the death of large numbers of plants.

Chaetomella Tritici Tehon & Daniels, n. sp.

Pycnidia superficial, connected with a ramose, brown mycelium within the host, densely setose, black, 75–100 μ in diameter. Setae straight, simple or one to several times dichotomously branched, tips obtuse, 200–300 μ long, branches often 30–40 μ long. Spores spherical to ovoid, olivaceous to brown, continuous, 4.4–5 μ in diameter.

On the inner surfaces of wheat glumes taken from prematurely dying heads.

Waterloo, Monroe County, Illinois, August 24, 1922. Acc. No. *971* (type).

The branched setae, illustrated in FIGURE 3, are reminiscent of *C. horrida* Oud.

Sphaeropsis Negundinis Tehon & Daniels, n. sp.

Cankers extensive on small twigs, thickly dotted with the scattered pycnidia. Pycnidia spherical, ostiolate, usually only

the ostiole protruding, nearly black, parenchymatically reticulate, 130–150 μ in diameter, the ostiole 15–17 μ wide. Spores ovoid to oblong, hyaline when young, becoming brown at maturity, non-septate, one-guttulate, often with a slight but evident geniscar, uniformly 11 x 20 μ; protoplasm appearing distinctly granular. (PLATE 25, FIG. 4.)

On diseased twigs of *Acer Negundo.*

Urbana, Champaign County, Illinois, June 3, 1922. Acc. No. *15198* (type).

The size and aspect of the spores of this species are suggestive of *S. grandinea* Ellis & Ev. and *S. simillima* Peck., both of which are reported on *Acer* sp. from Illinois. Pycnidia in our species are only half as large, however; and it is not likely that the Harpers, in their collecting, would have failed to distinguish between the maples and the box elder. Hence we are led to regard our material as specifically distinct. The enormous size (400–500 μ) of the pycnidia of *S. acerina* Ellis & Barth. precludes any possibility of confusion with it.

Coniothyrium Negundinis Tehon & Daniels, n. sp.

Cankers at the bases of small twigs, thickly dotted with pycnidia. Pycnidia scattered or frequently gregarious and even congregarious, black, ostioles protruding, 225–300 μ in diameter. Spores small, hyaline when young, olivaceous at maturity, spherical to ovoid, 2.2–4.4 μ in diameter.

On *Acer Negundo.*

Urbana, Champaign County, Illinois, June 3, 1922. Acc. No. *13413* (type).

Its larger pycnidia and much smaller, nearly spherical spores differentiate this species from *C. olivaceum* var. *Aceris* Ferraris, reported on *Acer.*

Cryptostictis Paeoniae Tehon & Daniels, n. sp.

Spots variable in size, 1–10 mm. in diameter, round to oval, tan to brown, definitely limited by a raised concolorous margin. Pycnidia black, spherical, papillate-roughened, semi-erumpent, 75–120 μ in diameter; ostiole 10 μ wide. Spores hyaline to greenish, 3-septate, nearly straight to falcate, 14–15 x 4–5 μ, walls of central 2 cells distinctly heavier; setae one to each terminal cell, hyaline, 3–4 μ long. (PLATE 25, FIG. 5.)

On leaves of *Paeonia officinalis*.

Bloomfield, Johnson County, Illinois, July 25, 1922. Acc. No. *6024* (type); Tampico, White County, August 15, 1922. Acc. No. *2065*.

Monochaetia Paeoniae (Maubl.) Sacc. & D. Sacc., which produces its acervuli on the branches of *Paeonia arborea*, has many characteristics in common with our species; and the two may be, as is true of other "Imperfecti," variations of the same fungus. We have not seen intergrading forms in connection with our species, however, and therefore prefer to record it separately.

Cryptostictis Violae Tehon & Daniels, n. sp.

Spots large, diffuse, yellow or tan, unlimited except by the veins, circular to oval, 0.5–1.5 cm. or more in diameter. Pycnidia abundant, scattered but most numerous toward the periphery of the spot, flask-shaped, the ostiole extruded or often the upper half of the pycnidium erumpent, dark brown, parenchymatically reticulate, 60–80 μ in diameter. Spores hyaline, 3-septate, often slightly curved, 2.2–3.5 x 14–16 μ. Bristles of the terminal cells hyaline, slightly curved, filiform, 8–10 μ long. (PLATE 25, FIG. 6.)

On leaves of *Viola* sp.

Rushville, Schuyler County, Illinois, July 13, 1922. Acc. No. *16631* (type).

Septoria Floridae Tehon & Daniels, n. sp.

Spots more or less angular, limited by the veins, 1–3 mm. in diameter, frequently confluent, at first brown and surrounded by a raised, darker brown border, later ashen to white and surrounded by a darker red or black margin, the whole furnished with a diffuse purplish halo, more apparent above. Pycnidia abundant in the older spots, scattered, erumpent above, spherical, 60–75 μ in diameter. Spores hyaline, cylindrical, obtuse, often somewhat curved, 1–3 septate, 16–22 x 3.5–4 μ.

On leaves of *Cornus florida*.

Thebes, Alexander County, Illinois, August 17, 1922. Acc. No. *595* (type).

It is impossible to reconcile this species with *S. cornicola* Desm., which we also have in Illinois. There are differences in the size and character of the spots and in the spores, which,

though apparently slight, are remarkably constant. Our species also has shorter spores than Peck's *S. canadensis;* and there are considerable differences in spot characters and spore width which separate it from Saccardo's *S. Corni-maris*.

Phaeoseptoria Caricis Tehon & Daniels, n. sp.

Spots small, 0.5–3 mm. long by 0.25–1 mm. wide, brown or tan, with a halo of purple extending several cm. along the leaf and uniting adjacent spots. Pycnidia few, scattered, rarely partially erumpent, parenchymatous, not carbonaceous, spherical or often becoming elliptical between veins, 70–100 μ in diameter. Spores long, cylindrical, olivaceous, one end acute, 7–10 septate, 70–80 x 7 μ. (PLATE 25, FIG. 7.)

On leaves of an unidentified *Carex*.

Ursa, Adams County, Illinois, June 28, 1922. Acc. No. *15455* (type).

Leptothyrium maximum Tehon & Daniels, n. sp.

Cankers relatively small, one internode in extent, thickly studded with pycnidia which are arranged in rows lengthwise of the twig. Pycnidia circular, dimidiate, subcuticular, 500–750 μ in diameter, parenchymatically reticulate; ostiole irregular, 20–40 μ wide. Spores ovoid to oblong, hyaline, thick walled, 20–25 x 11 μ.

On diseased twigs of *Acer Negundo*.

Urbana, Champaign County, Illinois, June 3, 1922. Acc. No. *1795* (type).

The extremely large size of the pycnidia and the larger spores are characters which distinguish this species as different from those now known on *Acer*.

Colletotrichum Smilacinae Tehon & Daniels, n. sp.

Spots very large and long, 1–1.5 x 2–6 cm., lying between the large veins and extending lengthwise of the leaf, white and papery with a very narrow but evident dark red margin, apparent both above and below. Acervuli numerous, scattered, generally epiphyllous, 30–105 μ in diameter. Setae numerous, long, slender, straight or curved, rigid, tapering to a subacute tip, dark brown throughout, 100–300 x 3.5–4 μ, with a bulbous base 6–10 μ thick. Conidiophores short, blunt, hyaline, 6–9 x 2–3 μ. Spores spindle- to boat-shaped, hyaline to greenish, both ends acute, 19–23 x 3–4 μ.

On leaves of *Smilacina racemosa.*

Goreville, Johnson County, Illinois, June 22, 1924. Acc. No. *7259* (type).

Cercospora Abutilonis Tehon & Daniels, n. sp.

Spots circular or subcircular, often confluent, 0.5–3 mm. in diameter, tan to brown above with a darker margin, less evident below. Fasciculae epiphyllous, scattered, upright, rarely of more than 3 hyphae. Conidiophores upright, straight or slightly flexed, 2–4 septate, 30–70 x 3.5–4 μ, with a distinct and characteristic purplish tinge added to their olivaceous color. Spores hyaline, oblong, with rounded ends, mostly without septa but often 1–3 septate, 17–20 x 3.5–4 μ. (PLATE 25, FIG. 8.)

On leaves of *Abutilon Theophrasti.*

Spring Valley, Bureau County, Illinois, August 17, 1922. Acc. No. *963* (type).

The spores of this species, which were found in abundance on the spots, are at once suggestive of a *Ramularia*, as may be seen in FIGURE 8. The evident, fuscous conidiophores mark it as a *Cercospora*, while the spore measurements and the distinctive purple tint of the hyphae readily separate it from *C. althaeina* Sacc., which has also been reported on *Abutilon.*

Cercospora Arborescentis Tehon & Daniels, n. sp.

Spots round or slightly angular, at first dark brown to black but later becoming cinereous with a definite black border, reaching 3 mm. in diameter. Fasciculae epiphyllous, scattered, ascending. Conidiophores flexuous, septate, brown, with light-fuscous apical cells. Spores hyaline, 3–5 septate, obclavate, 55 x 4.5–5.5 μ.

On leaves of *Hydrangea arborescens.*

Thebes, Alexander County, Illinois, August 17, 1922. Acc. No. *599* (type).

Cercospora Decodontis Tehon & Daniels, n. sp.

Foliicolous; spots subcircular to angular, brown, limited, with a darker, sometimes reddish, border, 1–3 mm. in diameter. Fasciculae almost entirely epiphyllous, numerous, scattered. Conidiophores fuliginous, upright, simple, 1–2 septate, nearly straight except at the tips where numerous crowded geniscars contribute to an evident irregularity, 40–110 x 4 μ. Spores

hyaline to smoky, straight or slightly curved, somewhat obclavate, 2–5 septate, 40–95 x 3.5 μ.

On *Decodon verticillatus*. (PLATE 25, FIG. 9.)

Wolf Lake, Union County, Illinois, August 16, 1922. Acc. No. *17196* (type).

Cercospora menthicola Tehon & Daniels, n. sp.

Spots numerous (on the type), circular or subcircular, 0.5–1.5 mm. in diameter, the center cinereous to whitish, bordered by a wide, dark red, indefinite, unraised margin, the entire spot occasionally dehiscent. Fasciculae few, gregarious in the center of the spot, spreading, of few hyphae, arising from a well-developed, subcuticular stroma 13–15 μ wide. Conidiophores lax, spreading, multiseptate, geniculate throughout their distal third, olivaceous to brown, 50–80 x 4 μ. Spores hyaline, acicular, 10–12 septate, 100–150 x 3.5 μ.

On leaves of *Mentha canadensis*.

Vandalia, Fayette County, Illinois, July 14, 1924. Acc. No. *13699* (type); Goreville, Johnson County, June 22, 1924. Acc. No. *8199*.

A certain similarity of aspect is evident between the conidiophores of this species and those of *C. Nepetae*, which is parasitic upon *Nepeta cataria*, another mint. In both cases they arise from a stromatic cluster of hyphal cells and are abundantly geniculate throughout their distal portions. Our species is especially distinguished, however, by the unusual development of the stroma, the small number (4 or 5) of hyphae in a fascicle, their laxness, and the more limited range of spore length.

Cercospora Paeoniae Tehon & Daniels, n. sp.

Spots circular or subcircular, 2–10 mm. in diameter, tan when young, brown when old and then marked with numerous concentric rings caused by the collapse of internal tissue and folding of the epidermis; margin indefinite. Fasciculae small, abundant, scattered, lax; basal tubercle not prominent. Conidiophores brown, undulating, geniculate toward the apex, 4–7 septate, 20–60 x 2–4 μ; basal cell distended and spherical. Spores hyaline, cylindrical or slightly obclavate, definitely falcate, 10–15 septate, 45–60 x 2–3 μ; geniscar not marked.

On leaves of *Paeonia officinalis*.

Prairie du Rocher, Randolph County, Illinois, August 24, 1922. Acc. No. *5645* (type).

This differs distinctly from *C. variicolor* Wint., which also occurs on *Paeonia*, in the length and septation of its conidiophores, and in the color, size and septation of the spores, as well as in the tubercle which, in our species, is never prominent but may often be nearly absent.

Cercospora Rhapontici Tehon & Daniels, n. sp.

Spots circular or subcircular, 2–4 mm. in diameter, centers grayish, margins brown and definite. Fasciculae amphigenous but more abundant above, scattered, lax, ascending, of 4 to 12 hyphae and from a small stromatic base. Conidiophores fuliginous to olivaceous, nearly straight, 2–4 septate below the geniscars which are usually several, prominently marked, and considerably separated, 60–75 x 5.5–6 μ. Spores long, cylindrical or cylindrical-obclavate, hyaline, 4–15 septate, 100–150 x 3–4 μ. (PLATE 25, FIG. 11).

On leaves of *Rheum Rhaponticum*.

Coxeyville, Monroe County, Illinois, August 24, 1922. Acc. No. *5111* (type).

There is no agreement between this species and *C. Rhei* Grog. reported in Europe on *Rheum officinale*, exsiccati specimens of which we have had for comparison.

Cercospora Zeae-maydis Tehon & Daniels, n. sp.

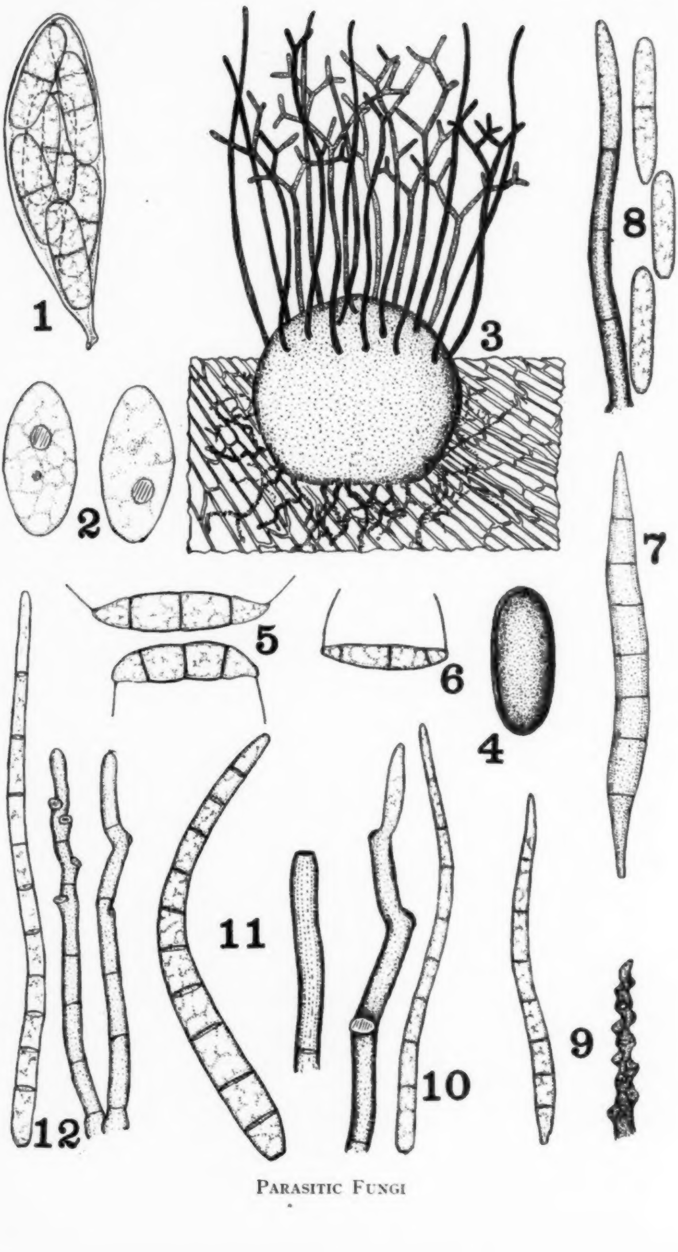
Spots brown or tan, evident above and below, ½ x 1–2 cm., or confluent and then much more extensive, not limited or bordered. Fasciculae amphigenous, abundant, scattered, low, spreading, long-oval, arising from nearly closed stomata. Conididiophores lax but ascending, 3–8 septate, olivaceous to brown, bearing a single apical geniscar, 70–90 x 4 μ. Spores hyaline, distinctly obclavate, 4–10 septate, 50–85 x 5–9 μ.

On leaves of *Zea Mays*. (PLATE 25, FIG. 12.)

McClure, Alexander County, Illinois, August 29, 1924. Acc. No. *4276* (type).

Aside from the fact that this appears to be the first record of a *Cercospora* on corn, the fungus is distinctive as well in its conidiophores, which bear a single apical spore scar, suggesting that they are single-spored only. We have not seen, in our collection, a single instance of multi-geniculation in this species—a condition which appears, in our experience, to be generally rare in the genus.

ILLINOIS STATE NATURAL HISTORY SURVEY,
URBANA, ILLINOIS



PARASITIC FUNGI

EXPLANATION OF PLATE 25

Fig. 1. Ascus of *Mycosphaerella cornicola.*
Fig. 2. Spores of *Phyllosticta Allii.*
Fig. 3. Pycnidium of *Chaetomella Tritici.*
Fig. 4. Spore of *Sphaeropsis Negundinis.*
Fig. 5. Spores of *Cryptostictis Paeoniae.*
Fig. 6. Spore of *Cryptostictis Violae.*
Fig. 7. Spore of *Phaeoseptoria Caricis.*
Fig. 8. Conidiophore and spores of *Cercospora Abutilonis.*
Fig. 9. Conidiophore tip and spore of *Cercospora Decodonis.*
Fig. 10. Conidiophores and spore of *Cercospora menthicola.*
Fig. 11. Conidiophore tip and spore of *Cercospora Rhapontici.*
Fig. 12. Conidiophore tip and spore of *Cercospora Zeae-maydis.*

FIVE NEW HYPOGAEOUS FUNGI

Helen M. Gilkey

(With Plate 26)

Tuber giganteum sp. nov.

Ascocarp light yellowish-gray, with wide white venae externae conspicuous on surface, 1.8–5.5 cm. in diameter, sub-globose, much convoluted; surface very minutely scabrous; gleba light chocolate colored at maturity, marbled with distinct shining white veins varying in width, older specimens containing several large fissures from breaking along venae externae; venae externae rarely converging at a distinct point; outer layer of cortex pseudoparenchymatous, changing to loose hyphal tissue which gradually merges into sub-cortical layer of more slender hyphae; thickness from the surface to the hymenium 220–260 μ; venae internae and hymenial tissue similar to structure of the sub-cortex; venae externae of loosely arranged hyphae, breaking away at maturity to form fissures; asci not stipitate, semi-globose, 52–70 x 74–80 μ, 1–4- (rarely 5-) spored; spores dark yellowish-brown, ellipsoid or ovoid, 17–39 x 35–52 μ, alveolate, 5–9 x 7–10 alveoli across the diameters, these varying somewhat in size on a single spore; also apparently very minute alveoli on inner surface of epispore; sculpturing 2–3 μ in height. (Plate 26, Fig. 1.)

Collected in clay soil under trees and shrubs, by John Sert, at Bandon, Oregon, May 2, 1921.

This is, to my knowledge, the largest *Tuber* reported from the United States, several specimens of the collection reaching 5.5 cm. in diameter. Mr. Sert discovered the fruiting bodies from several inches to a foot deep in a clay hillside which was being graded for a road bed. The spores are long-ellipsoid like those of *Tuber gibbosum* Hark., but are rounded rather than pointed at the ends and are generally smaller. The ascocarp of *T. gibbosum* is cinnamon-brown rather than yellowish-gray; the surface is covered with knotty hairs which are absent in the above described species; and the inner surface of the epispore does not show the secondary sculpturing described above.

Tuber longisporum sp. nov.

Ascocarp purplish-brown (in material preserved in alcohol), slightly lobed, 1–1.5 cm. in diameter; surface somewhat coarsely verrucose; gleba brown (in preserved material); cortex coarsely and regularly pseudoparenchymatous, light brown in color for 100 μ or more inward from bases of verrucosities, changing rather abruptly to sub-cortex of whitish, coarse, compactly arranged, more or less united hyphae; thickness of complete peridium below base of papillae 200 μ or sometimes more; papillae approximately 100 μ high; venae externae filled with loose hyphae which sometimes break away in older ascocarps leaving wide hollow canals in the ascocarp; venae internae and tissue between asci continuing from sub-cortex and composed of somewhat closely associated but unconnected and coarse hyphae; asci fragile, 66–76 μ, 1–4-spored; spores yellow, mostly long-ellipsoid, generally somewhat pointed at both ends, 20–32.5 x 27–45 μ, coarsely alveolate, 3–5 x 4–7 alveoli across diameters; minute alveoli apparent on inner surface of epispore. (PLATE 26, FIG. 2.)

Collected in McGowan's Woods, Ithaca, N. Y., H. H. Whetzel, July 20, 1903. Herbarium Cornell University, No. *1712*.

This species differs from *Tuber Gardnerii* Gilkey (which it most closely resembles in surface markings, color and spore size) in being less convolute, having the spores generally more pointed at both ends (the shape varies somewhat in different specimens) and with coarser and generally fewer alveoli. It differs from *T. gibbosum* Hark. which it resembles in shape of spores, in the surface of the ascocarp which in this species is decidedly verrucose while in *T. gibbosum* Hark. it is only minutely scabrous; in inconspicuous depressions not filled with hairs; and in commonly smaller spores.

Tuber bisporum sp. nov.

Ascocarp brick-red, 2 cm. in diameter, subglobose with a few large lobes; surface verrucose; gleba light colored, becoming dusky as the spores mature; veins white, conspicuous; outer portion of the cortex through the papillae pseudoparenchymatous, remainder of the cortex composed of compactly interwoven fibers, more loosely arranged toward the hymenium; thickness of the peridium 400–800 μ; peridium easily separable from the gleba at maturity; tissue between the asci like the tissue of the cortex; venae externae filled with loosely arranged coarse hyphae; asci generally very short-stipitate, globose to ellipsoid, occasionally

pyriform, 90–128 μ, generally 2- (rarely 1- or 3-) spored; spores dark brown, globose to globose-ellipsoid, 42–57 x 48–62 μ, coarsely alveolate, the alveoli 4–7 x 5–8 across the diameters; sculpturing 3–4 μ in height; minute alveoli apparent on inner surface of epispore. (PLATE 26, FIG. 3.)

Collected in a closely wooded hillside ravine, Six Mile Gorge, near Ithaca, New York, August 26, 1924, by Professor J. H. Miller. Herbarium, Cornell University, No. *12690*.

This species is closely related to *Tuber irradians* Gilkey, but differs from it in color of the ascocarp, in the presence of pseudoparenchyma only in the papillae, in the absence of radial rows of cells in the cortex, in larger spores, and in the presence of minute alveoli on the inner surface of the epispore.

Choeromyces ellipsosporus sp. nov.

Ascocarp silvery white when young, becoming yellowish at maturity, 1–1.5 cm. in diameter, irregular in shape, sometimes elongated, variously lobed, surface minutely scabrous; young ascocarps provided with one or more rhizomorphs which shrivel and disappear at maturity; cortex 200–250 μ thick, formed of coarse hyphae which coalesce more or less uniformly to form pseudoparenchyma; cortical tissue continuous with that of gleba in which both pseudoparenchyma and separate hyphae appear, the cells becoming 100 μ in diameter; gleba yellowish, traversed by winding hyphae-filled canals lined with hymenium, these surrounded by a layer of closely interwoven hyphae which become loosely arranged midway between the canals to form irregular winding passageways filled with coarse hyphae and opening to the surface of the ascocarp in fissures; asci very delicate and easily ruptured at maturity, clavate, stipitate, 8-spored, 22.5 x 75–100 μ; spores generally 1- or irregularly 2-seriate, slightly yellowish, globose-ellipsoid, 10–11 x 12.5–13.5 μ, containing one large oil globule; surface of spore covered with minute low papillae, some of which anastomose. (PLATE 26, FIG. 4.)

All previously known species of *Choeromyces* are described with globose spores. Since in all principal points, however, the fungus here described answers to the description of *Chaeromyces*, it has been placed under that genus, the difference in spore shape, also in size of spores and asci, sculpturing, and minor differences in ascocarp character, distinguishing it as a new species.

Collected by H. E. Parks in soil under leaf mold, Santa Clara County, California. No. *1235*.

BARSSIA gen. nov.

Ascocarp scabrous to verrucose, reddish-yellow, nearly even to lobed, somewhat flattened with an irregular opening at the apex into a central depression; cortical structure of the surface of the ascocarp carried into the depression except where the hymenium projects into it; inner tissue of the ascocarp thrown up in more or less connected folds, forming canals and chambers lined with hymenium, these canals opening into the cavity of the ascocarp; hymenium composed of regularly arranged asci and paraphyses; paraphyses very slender and much longer than the asci; asci cylindrical, somewhat club-shaped, 8-spored; spores ellipsoid, smooth, 1- or incompletely 2-seriate, colorless.

The new genus of Tuberaceae proposed above is for the purpose of accommodating a fungus which has twice been collected this season in considerable numbers. Both immature and mature specimens have been found. It differs from *Genea* which it superficially resembles in having the characteristic hollow chamber formed rather as a depression of the surface than as an internal cavity. This depression is lined with cortex, as is the cavity in *Genea*, but in *Genea* it is a secondary cortex developed from the extended paraphyses, while in the former genus it has no relationship to paraphyses. *Genea* also has sculptured spores while in this fungus the spores are smooth and hyaline. The new fungus differs from *Pseudobalsamia* in having unconnected canals and chambers, definite apical depression, no evidence of a mycelial tuft at the base, and in the possession of a regular hymenium consisting of mostly cylindrical asci and paraphyses. It somewhat resembles *Pachyphloeus*, but resemblance ceases in the character of the depression and its relation to the hymenium, also in the appearance of the spores. *Stephensia* has a basal instead of an apical opening, the cavity opens directly to the hymenium as in *Pachyphloeus*, and the spores are globose. *Hydnotrya* has sculptured spores and no definite cavity into which the venae externae open. The spores of the new fungus resemble those of *Hydnocystis* and *Geopora*, but the distinct venae externae opening to the surface through the cortex of the depression clearly place it with the Tuberaceae rather than the Balsamiaceae to which *Hydnocystis* and *Geopora* belong.

The generic name is given in honor of its discoverer, Professor H. P. Barss, head of the department of Botany and Plant Pathology, Oregon State College.

Barssia oregonensis sp. nov.

Ascocarp reddish-yellow, 1–2.5 cm. in diameter, somewhat lobed, more or less flattened, with an apical depression forming an irregular cavity within the ascocarp; surface scabrous to verrucose; cortex mostly consisting of coarse hyphae, these sometimes uniting near the surface to form irregular pseudoparenchyma, swollen tips of the hyphae sometimes projecting from the surface as in *Hydnotryopsis;* gleba penetrated by empty unconnected chambers and canals with hymenium-covered walls, opening into the depression of the ascocarp; hymenium consisting of regularly arranged asci and paraphyses; asci mostly cylindrical, sometimes slightly club-shaped, 20–30 x 170 μ; paraphyses very slender, not swollen at the tips, extending 40–50 μ beyond the tips of the asci; spores smooth, hyaline, ellipsoid, 15 x 26 μ. (PLATE 26, FIGS. 5, 6.)

In earth one to three inches deep under leaf mold beneath tree of *Cascara sagrada*, Benton County, Oregon, H. P. Barss, No. *4833*, Apr. 12, 1925; same locality, H. P. Barss, No. *4834*, Apr. 26, 1925. O. A. C. Mycological Herbarium.

No mycelial attachment was found in any collection of these plants, but the opening into the cavity of the ascocarp was constantly discovered upon the upper side of the fruiting body as it occurred in the soil. Occasionally this opening was extended down one side. It is hoped that with future collections of specimens which are younger than those known at present, the relationship of this fungus with *Pachyphloeus* and *Stephensia*, whose cavity opens directly to the hymenium, may be learned.

CORVALLIS, OREGON

EXPLANATION OF PLATE 26

Fig. 1. *Tuber giganteum.* Spore, × 750 diameters.

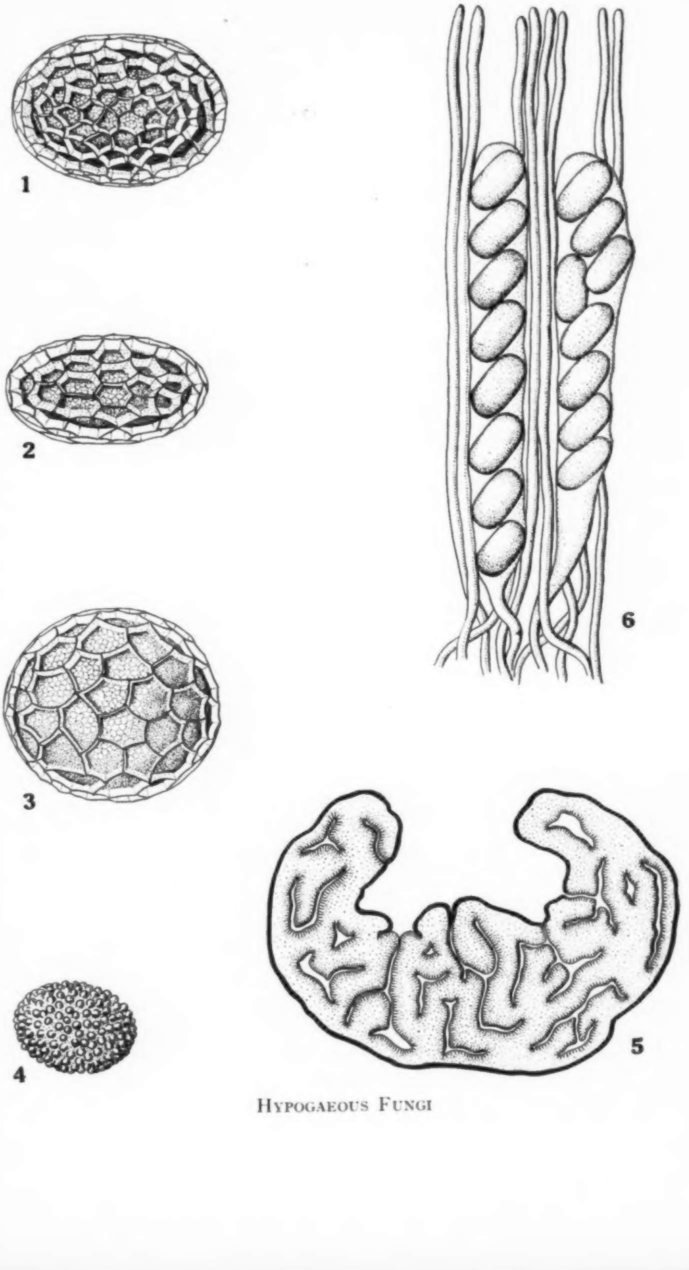
Fig. 2. *Tuber longisporum.* Spore, × 750 diameters.

Fig. 3. *Tuber bisporum.* Spore, × 550 diameters.

Fig. 4. *Choeromyces ellipsosporus.* Spore, × 1500 diameters.

Fig. 5. *Barssia oregonensis.* Longitudinal section through ascocarp, showing depression lined with cortex, into which canals open. × 3 diameters.

Fig. 6. *Barssia oregonensis.* Portion of hymenium showing asci, spores, and paraphyses, × 380.



HYPOGAEOUS FUNGI

RUSTS OF BRITISH GUIANA AND TRINIDAD

H. Sydow

(With 1 Text Figure)

The rusts herewith reported were collected by Professor F. L. Stevens, University of Illinois, during the summer of 1922 in British Guiana and Trinidad, and were referred by him to me for determination.

Although the collection is not large, yet it seems to be of some interest, as the Uredineae of the regions mentioned are but poorly known up to date. I suppose that the region is not rich in representatives of this family.

Coleosporium Lév. Ann. Sci. Nat. III. **8**: 373. 1847

Coleosporium Ipomoeae (Schw.) Burr. Bull. Ill. Lab. Nat. Hist. **2**: 217. 1885.

On *Ipomoea glabra*, British Guiana: Tumatumari, 7–8–1922, No. *56*.

Milesina P. Magn. Berichte Deutsch. Bot. Ges. **27**: 325. 1909

Milesina Lygodii Sydow, n. sp.

Uredosori hypophylli, maculis decoloratis, irregularibus insidentes, sparsi vel hinc inde pauci aggregati, minutissimi, rotundati, 0.1–0.14 mm. diam., flavi vel flavo-brunneoli, peridio superne ex cellulis irregulariter polygonalibus composito cincti; uredosporae ovatae, ellipsoideo-ovatae vel piriformes, laxiuscule aculeate, hyalinae, 24–26 x 18–25 μ, membrana 1.5 μ crassa; teleutosporae non visae.

On *Lygodium* sp., British Guiana: Tumatumari, 7–11–1922, No. *154*.

Crossopsora Sydow, Ann. Myc. **16**: 243. 1918

Crossopsora Stevensii Sydow, n. sp.

Uredosori hypophylli, maculis flavidis vel confluendo majoribus et irregularibus insidentes, sparsi vel saepius plures laxe gregarii,

minuti, punctiformes, ferrugineo-brunnei, vel flavo-brunnei, paraphysibus numerosis basi coalitis rectis vel parum introrsum curvatis subhyalinis vel pallidis, 40–70 μ longis 7–12 μ latis, tenuiter (1–1.5 μ) tunicatis vel ad apicem crassius tunicatis cincti; uredosporae ovatae vel ellipsoideae, aculeatae, subhyalinae usque pallide brunneolae, 25–36 x 19–25 μ, membrana 1–1.5 μ crassa, poris germ. obscuris; teleutosori hypophylli, e centro sororum uredosporiferorum oriundi, filiformes, 1–1.5 mm. longi, 45–70 μ crassi, recti vel curvati, obscure brunnei; teleutosporae firme conjunctae, ellipsoideae usque elongatae, plerumque utrinque attenuatae, leves, ferrugineae, 35–55 x 16–20 μ, continuae, episporio 1 μ crasso.

On species of Asclepiadaceae, British Guiana: Rockstone, 7–17–1922, Nos. *490* and *491*.

On *Echites tomentosa*, Trinidad: Cumuto, 8–16–1922, No. *933*.

KUEHNEOLA P. Magn. Bot. Centralblatt **74**: 169. 1898

KUEHNEOLA GOSSYPII (Lagerh.) Arth. N. Am. Fl. **7**: 187. 1907.

On cultivated cotton, British Guiana: Georgetown, 7–4–1922, No. *20*.

ERIOSPORANGIUM Bert.; Lév. Ann. Sci. Nat. III. **5**: 269. 1846

ERIOSPORANGIUM HYPTIDIS (Curt.) Arth. N. Am. Fl. **7**: 211. 1912.

On species of Labiatae, British Guiana: Tumatumari, 7–11–1922, No. *179*.

ENDOPHYLLUM Lév. Mem. Soc. Linn. Paris **4**: 208. 1825

ENDOPHYLLUM GUTTATUM (Kunze) Sydow, Ann. Myc. **18**: 179. 1920.

On *Cissus sicyoides* L., British Guiana: Coverden, 8–4–1922, Nos. *738*, *745*. Trinidad: Cumuto, 8–16–1922, No. *901*.

ENDOPHYLLUM PUMILIO (Kunze) Sydow, Ann. Myc. **18**: 179. 1920.

On *Clibadium* sp., British Guiana: Coverden, 8–4–1922, No. *737*; 8–5–1922, No. *754*.

ENDOPHYLLOIDES Whetzel & Olive, Am. Jour. Bot. **4**: 50. 1917

ENDOPHYLLOIDES PORTORICENSIS Whetzel & Olive, Am. Jour. Bot. **4**: 51. 1917.

On *Mikania* sp., British Guiana: Coverden, 8–5–1922, No. *756*.

MARAVALIA Arth. Bot. Gaz. **73**: 60. 1922

Maravalia Ingae Sydow, n. sp.

Teleutosori hypophylli, maculis flavis vel flavo-brunneolis 0.5–1.5 cm. diam., insidentes, plus minus copiose in quaque macula evoluti, punctiformes, pulvinati, ca 0.2 mm. diam., mox nudi, primo flavo-brunnei, dein ob germinationem albi et velutini; teleutosporae clavatae, elongato-oblongae vel cylindraceae, ad apicem rotundatae, ad basim plerumque attenuatae, hyalinae, leves, 60–90 x 15–20 μ, episporio ca 0.5 μ crasso, statim germinantes; pedicello hyalino, longiusculo, 8–10 μ crasso; sporidia globulosa, 8–10 μ diam.

On *Inga* sp., British Guiana: Vreedn Hoor, 8–1–1922, No. *715*. Type. Trinidad: Coverden, 8–8–1922, No. *790*.

The genus *Maravalia* has been established by Arthur and Thaxter with one species, *M. pallida*, growing on *Pithecellobium latifolium* in Trinidad. The new species from Guiana is certainly very closely related to the type species, and one might even believe that both are identical, but I prefer to keep them distinct as they live on different host genera. Judging from the description of the type species which I have not yet seen, the Guiana fungus differs only slightly by smaller, less confluent sori and somewhat larger spores.

A third member of the genus is *Uromyces albescens* Syd., described in Ann. Myc. **14**: 66, 1916, on *Pithecellobium glomeratum* from Peruvia. It now becomes *Maravalia albescens* Syd.; it seems to differ in the smaller spores.

UROMYCES Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1816

UROMYCES COLUMBIANUS Mayor, Mém. Soc. Neuch. **5**: 467. 1913.

On *Melanthera* sp., Trinidad: St. Clair, 8–15–1922, No. *886*.

UROMYCES DOLICHOLI Arth. Bull. Torrey Club **33**: 27. 1906.

On *Cajan cajan*, Trinidad: Port of Spain, 8–14–1922, No. *869*.

UROMYCES LEPTODERMUS Sydow; Sydow & Butler, Ann. Myc. **4**: 430. 1906.

On *Lasiacis sorghoidea*, Trinidad: St. Clair, 8–15–1922, No. *887*.
On *Panicum barbinode*, British Guiana: Georgetown, Lemada Canal, 8–2–1922, No. *717*.

UROMYCES PROËMINENS (DC.) Pass. Rab. Fungi Eur. *1795*. 1873.

On *Chamaesyce* sp., Trinidad: Port of Spain, 8–14–1922, No. *859*.

UROMYCES SCLERIAE P. Henn. Hedwigia Beibl. **38**: 67. 1899.

On *Scleria melaleuca*, British Guiana: Kartabo, 7–23–1922, No. *616;* Kartabo, 7–21–1922, No. *507*. Trinidad: Cumuto, 8–16–1922, No. *905;* St. Augustine, 8–13–1922, No. *840*.

UROMYCES WULFFIAE-STENOGLOSSAE Diet. Ann. Myc. **6**: 96. 1908.

On *Wulffia baccata*, British Guiana, Demerara-Essequibo R. Ry., 7–15–1922, No. *343;* Wismar, 7–14–1922, No. *282;* Demerara-Essequibo R. Ry., 7–15–1922, No. *396;* Georgetown, Lemada Canal, 8–2–1922, No. *713*. Trinidad: St. Clair, 8–15–1922, No. *885*.

PUCCINIA Pers. Tent. Disp. Fung. 38. 1797

PUCCINIA ANTIOQUIENSIS Mayor, Mém. Soc. Neuch. Sci. Nat. **5**: 743. 1913.

On *Cyperus diffusus*, British Guiana: Tumatumari, 7–10–1922, No. *137*.

PUCCINIA ARECHAVALETAE Speg. Ann. Soc. Ci. Arg. **12**: 67. 1881.

On *Cardiospermum* sp., British Guiana: Coverden, 8–4–1922, No. *734*.

PUCCINIA CANALICULATA (Schw.) Lagh. Ured. Herb. El. Fries 51. 1894.

On *Cyperus* sp., British Guiana.

PUCCINIA CANNAE (Wint.) P. Henn. Hedwigia **41**: 105. 1902.

On *Canna* sp., British Guiana: Peters Hall, 7–5–1922, No. *26;* Kartabo, 7–21–1922, No. *511;* 7–2–1922, No. *12.* Trinidad: Port of Spain, 6–28–1922, No. *4;* Port of Spain, 8–14–1922, No. *867.*

PUCCINIA CENCHRI Diet. & Holw. Bot. Gaz. **24**: 28. 1897.

On *Cenchrus echinatus*, British Guiana: Georgetown, 7–2–1922, No. *9.*

PUCCINIA ELEUTHERANTHERAE Diet. Ann. Myc. **7**: 354. 1909.

On *Eleutheranthera ruderalis*, British Guiana: Georgetown, 7–2–1922, No. *13.* Trinidad: St. Augustine, 8–13–1922, No. *823.*

PUCCINIA EMILIAE P. Henn. Hedwigia **37**: 278. 1898.

On *Emilia coccinea*, Trinidad: Port of Spain, 8–14–1922, No. *874.*

PUCCINIA GYMNOPOGONIS Sydow, Monogr. Ured. **1**: 755. 1904.

On *Gymnopogon foliosus*, British Guiana: Demerara-Essequibo R. Ry., 7–15–1922, No. *405.*

PUCCINIA GOUANIAE Holw. Ann. Myc. **3**: 21. 1905. (Pycnia and primary uredinia.)

On *Gouania* sp., British Guiana: Rockstone, 7–13–1922, No. *251.*

PUCCINIA IGNAVA (Arth.) Arth. Mycologia **14**: 17. 1922.

On *Bambusa* sp., British Guiana: Rockstone, 7–17–1922, No. *447;* Coverden, 8–4–1922, No. *720.*

PUCCINIA SEAVERIANA Arth. Mycologia **14**: 18. 1922.

On *Oliganthes condensatus*, Trinidad: St. Clair, 8–15–1922, No. *888.*

PUCCINIA TUBULOSA (Pat. & Gail.) Arth. Am. Jour. Bot. **5**: 464. 1918.

Uredo paspalicola P. Henn. Hedwigia **44**: 57. 1905.

On *Paspalum conjugatum*, British Guiana: Peters Hall, 7–5–1922, No. *25.*

On *Paspalum virgatum*, British Guiana: Georgetown, 7–2–1922, No. *17;* Tumatumari, 7–8–1922, No. *31.*

PUCCINIA URBANIANA P. Henn. Hedwigia **37**: 278. 1898.

On *Stachytarpheta* sp., British Guiana: Tumatumari, 7–10–1922, No. *131.*

DASYSPORA Berk. & Curt. Jour. Acad. Phila. **2**: 281. 1853

DASYSPORA GREGARIA (Kunze) P. Henn. Hedwigia **35**: 231. 1896.

Dasyspora foveolata Berk. & Curt. Jour. Acad. Phila. **2**: 281. 1853.

On Anonaceae sp.?, British Guiana: Kartabo, 7–23–1922, No. *589.*

This collection is exceedingly interesting because it bears the pycnidial and uredo stages of this remarkable fungus. The latter stage is quite peculiar and entirely different from the ordinary uredospores of the Uredineae.

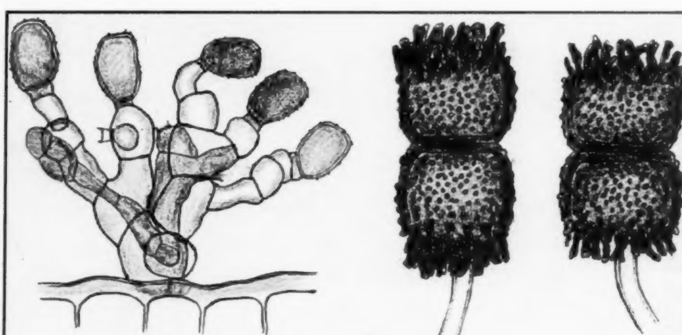


FIG. 1. *Dasyspora gregaria*

The pycnia, more or less numerous, occur on the upper side of the leaves in circular groups of about 4–6 mm. in diameter. They are flattened, conical, black bodies, originating beneath the epidermis and measuring about 120–160 μ in breadth and 80–100 μ in height.

The uredosori are either epiphyllous together with pycnia, or

more numerous on the lower side. They represent very small, but densely crowded tufts, consisting of more or less numerous hyphae. Unfortunately the material placed at my disposal being only scanty I could not make out with certainty whether the hyphae originate beneath the cuticle or beneath the epidermis although I think the latter is the case. Either one hypha alone or a few fascicled ones are seen to break through the epidermis (or cuticle?). The primary hypha, first consisting of two or three large cells only, soon branches; the primary branches soon form new outgrowths which often branch again in turn, hence at last tufts of many spreading branched hyphae are formed. Even when the primary hypha is very short and consists of only two cells it forms a single uredospore at its tip. The spore grows rapidly and when mature falls off. Now the apical hyphal cell grows on and forms a new cell which gives rise to a new uredospore and so on in the same manner the branches continue growing and forming new uredospores on the top of each cell. The longest hyphae observed measured up to 250 μ in length, consisting of about ten cells. The cells are irregular in shape and size, the basal cells being ordinarily the largest ones, while the upper cells are the smallest. They measure up to 25 μ in length and 14–18 μ in breadth.

The thin-walled uredospores are uniformly ellipsoidal, with yellow contents. The hyaline membrane is only 1 μ thick and densely and minutely verrucose. The spores measure 22–24 μ in length and 16–18 μ in breadth. The germ pores are obscure.

The peculiar structure of the uredo stage is best seen from the accompanying figure. This represents a small tuft only, also two teleutospores.

If I am correctly informed the uredo stage has been mentioned only once [1] but I am unable to find that any description has been published up to date.

AECIDIUM Pers. in J. F. Gmel. Syst. Nat. **2**: 1472. 1791

AECIDIUM ALIBERTIAE Arth. Mycologia **14**: 21. 1922.

On *Alibertia* sp., Trinidad: Cumutò, 8–16–1922, Nos. *931*, *957*, *965*.

[1] See Bull. Torrey Club **48**: 39. 1921.

AECIDIUM CORDIAE P. Henn. Bot. Jahrb. **17**: 491. 1893.

On *Cordia cylindrostachya*, Trinidad: St. Clair, 8–15–1922, No. *892*.

The specimens agree entirely with the type of *Aecidium Cordiae* P. Henn., as the spores are coarsely verrucose, and the membrane much thickened at the apex. *Aecidium brasiliense* Diet., which according to Arthur grows on the same host (*Cordia cylindrostachya*) in Trinidad, differs by the much smaller, less verrucose, not thickened spores.

AECIDIUM RIONEGRENSE P. Henn. Hedwigia **43**: 166. 1904.

On species of Anonaceae, British Guiana: Wismar, 7–14–1922, No. *273;* Demerara-Essequibo R. Ry., 7–15–1922, No. *355;* Penal Settlement, 7–25–1922, No. *681*.

UREDO Pers. Ann. Bot. Usteri **15**: 16. 1795

UREDO ARTOCARPI Berk. & Br. Jour. Linn. Soc. **14**: 93. 1873.

On species of Moraceae (breadfruit), British Guiana: Tumatumari, 7–11–1922, No. *185*.

UREDO CYRTOPODII Sydow, Bull. Herb. Boissier **1**: 77. 1907.

On *Cyrtopodium* sp., British Guiana: Demerara-Essequibo R. Ry., 7–15–1922, No. *395*.

Compared with the type specimen from Brazil and found to agree in every respect.

UREDO DIOSCOREAE P. Henn. Hedwigia **42**: (108). 1903.

On *Dioscorea* sp., British Guiana: Tumatumari, 7–9–1922, No. *91*.

UREDO IGNOBILIS Sydow, Ann. Myc. **4**: 444. 1906.

On *Sporobolus indicus*, British Guiana: Georgetown, 7–2–1922, No. *15*.

BERLIN-SCHÖNEBERG,
GERMANY.

NOTES AND BRIEF ARTICLES

Dr. F. D. Kern, of Pennsylvania State College, has been granted a year's leave of absence and will assume the duties of Dean of the College of Agriculture of Porto Rico, Mayaquez. Dr. Kern and family will take up their residence in Porto Rico for one year.

"Plant Disease Fungi" is the title of a new book by F. L. Stevens. It is a revision and a condensation of his former work, "The Fungi Which Cause Plant Disease." The book comprises 468 pages of text and 407 illustrations, and will be much used by plant pathologists as a guide in determining the organism responsible for the many diseases of cultivated plants.

During a recent visit to Cornell University the writer had the privilege of looking over the Durand collection of Discomycetes, purchased by the university. The collection is kept together as a unit by itself and in a separate room. It consists of preserved plants, microscopic slides, and a very extensive set of notes. It is probably the most complete collection of Discomycetes in America. As a student of this particular group it is my intention to spend considerable time in the near future working over this material preparatory to a monograph of the cup-fungi of North America.—Fred J. Seaver.

Mycological Foray

(With 1 Text Figure)

During the early part of June the New York Botanical Garden joined with Cornell University, Department of Plant Pathology, and the Pennsylvania State College, Department of Botany, in a mycological excursion to Trout Run, Pennsylvania. This is the third "foray" of this nature held by the above institutions. On the former occasions Brooklyn Botanic Garden and Syracuse

University also joined the enterprise. There has been some thought of making this an annual affair to be participated in by the mycologists of a number of the eastern institutions or at least as many as might see fit to join.

FIG. 1. In the Pennsylvania woods

There is much to be gained by such a meeting. It gives the various mycologists a chance to get together and, in an informal way, to talk over the problems of mutual interest. Participated in, as it is, by the teachers and graduate students of the various institutions, it is a source of inspiration to both the teacher and student. Also the amount of material obtained even in a few days by such a company, each with his own special mycological interest, is considerable. The material is divided into sets and one set of specimens turned over to each of the institutions represented. Such a collection not only results in the extension of our knowledge of the range of distribution of the more common species but often adds new or rare fungi to our herbaria.

It was the writer's privilege to attend the most recent expedition June 5–7 at Trout Run, Pennsylvania. Leaving New York on the night train, Thursday, June 4, our train arrived in Ithaca

early Friday morning. There, joined by the Cornell party, after a hurried breakfast we started for a one hundred and twenty mile drive by auto to the place previously selected for the outing where we were to be met by the Pennsylvania State College contingent. The early morning drive through southern New York and northern Pennsylvania over the splendid concrete roads of that section was a very inspiring one. Arriving at our destination about noon we were soon joined by the Pennsylvania party and the remainder of the day was spent in the hills in the immediate vicinity of Trout Run, in the heart of the Pennsylvania mountains.

The following day, Saturday, it was planned to spend the entire day in the woods about seven miles from the village where some of the party were camping, the dinner to be cooked by the campers and partaken of in camp style. Although the weather was excessively hot the fungi seemed to be rather backward probably owing to the unusually cold spring but a creditable number of plants was collected.

Returning to the village in the evening we started on our return trip the next morning, Sunday, stopping at favorable points for continued collecting, reaching Ithaca Sunday afternoon. The following day, Monday, was spent at the University looking over the "plunder" and comparing notes, the return to New York being made by the night train arriving home Tuesday morning.

Suitable labels have been printed and the material is being prepared for distribution and mounting. The accompanying photograph shows those present on the second day of this occasion. Others attended for the first day only.

FRED J. SEAVER

MISS LISTER'S "MYCETOZOA"

The third edition of Lister's monograph of the "Mycetozoa" has just appeared. The first edition of this standard work on the slime-moulds appeared in 1894 and represented the results of many years of labor on the part of Mr. Arthur Lister. The drawings many of which were in color were executed by Mr. Lister and his able daughter Miss Gulielma Lister. Mr. Lister died July 19, 1908.

The widespread interest in the first edition resulted in bringing in much new material. As a result of this Miss Lister prepared a second edition, much enlarged and with improvements in the quality of the plates. The second edition appeared in 1911.

The third edition dated January, 1925, includes three additional genera and forty-six new species. Some of the new species are raised from varietal rank. Twenty-two new plates have been added, eight of which are colored.

With the appearance of this and Macbride's second edition of "North American Slime-Moulds" the American student is able to avail himself of the most recent information on this group of organisms.

A fine specimen of the fungus commonly known as "tuckahoe" has recently been received from Dr. F. A. Wolf of the North Carolina Agricultural Experiment Station. The specimen is accompanied by the following statement: "I am sending to you under other cover, a large tuckahoe which weighed in the fresh condition, 4½ lbs. This specimen came into the laboratory on July 2, and a week later had formed a fruit body which you see at one end of the specimen. I have tried to wrap the specimen carefully so that it would reach you in good condition. Some time ago, I promised to send to the New York Botanical Garden for their popular exhibit, a fruiting specimen, in case one came to hand. The one which is being sent to you is much the best one which I have yet developed. It has the additional interest of having been formed on a corn stalk. You can see in the cortical tissues, remnants of the rind of the stalk. You can note, too, that the joint or node occurs at the middle of the tuckahoe."

This specimen is a valuable addition to our mycological exhibit.

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New names and the final members of new combinations are in **bold face type**